

# **2013 Missouri Department of Conservation Oak Mast Survey Report**

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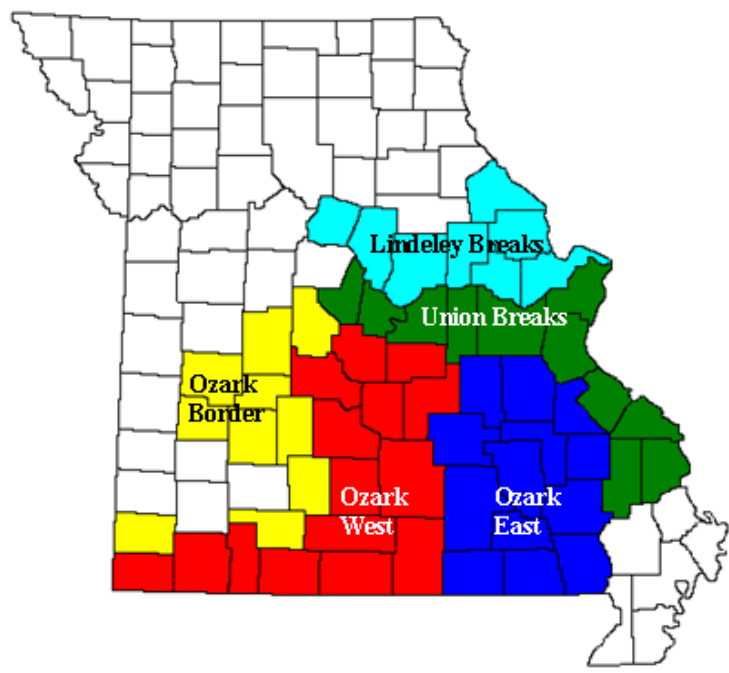
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## **BACKGROUND**

Oak mast is a very important source of fall and winter food for many species of wildlife, particularly in the heavily forested portions of the state. Fluctuations in mast production can exert a strong influence on wildlife species that depend on mast crops for food, and can influence fall and winter wildlife movements. Poor mast years have resulted in lowered reproductive success in wildlife species, which can reduce the size of wildlife populations. During poor mast years, some wildlife species will travel a greater distance in search of food and are more likely to feed around agricultural areas and forest edges, rather than the forest interior. As a result, wildlife will tend to be more concentrated, and hunter success may consequently increase. Conversely, good mast years can improve individual fitness and overwinter survival of wildlife species, but may reduce hunter success as wildlife will be more dispersed. Additionally, mast production is essential for oak regeneration and persistence in the short-term and migration of oak species in response to environmental changes over longer time scales (e.g., climate change).

The Missouri Department of Conservation has conducted an annual survey of mast production since 1960. The majority of this data has been collected in oak-hickory forests located in five regions of central and southern Missouri (Figure 1). Individual, mature (i.e., potentially seed-producing) oaks are visually rated according to the number of developing acorns in crowns and classified as supporting high, moderate, low, or few to no acorns. A mast production index (MPI) is generated from this data to provide an estimate of the availability of oak mast, giving MDC and the public an indication of what is in store for mast-dependent forest wildlife during fall and winter. Most of these surveys have been conducted voluntarily by MDC Forestry Division staff. The Missouri Forestkeepers Network has also assisted in conducting this survey, which has augmented the data collected by MDC. Information on mast production is used by resource managers, the news media, and the public, particularly hunters.



**Figure 1. Five oak mast regions captured by MDC annual mast survey**

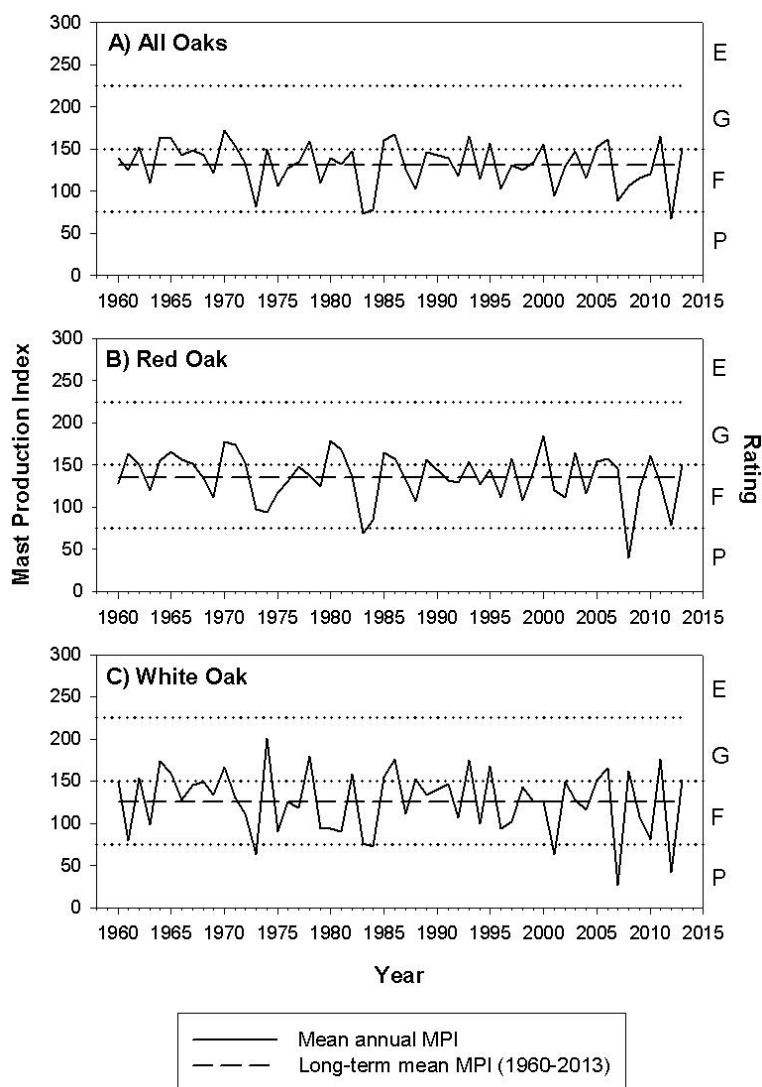
## RESULTS

### Statewide

In 2013, MDC staff and Missouri Forestkeepers Network volunteers sampled 5,774 oak trees: 2,652 trees from the red oak group and 3,122 trees from the white oak group. The mast production of all oaks was fair to marginally good (Table 1) with a MPI of 150 (Figure 2a). For comparison, this represents a 121% increase from 2012 (MPI = 68) and an increase of 15% over the 53-year average (MPI = 131). Red oak mast production for 2013 was fair to marginally good (MPI = 150; Figure 2b), which is an increase of 92% from last year's production (2012 MPI = 78) and 15% above the long-term average (135) for the group. This year's white oak mast production was on the low end of good (MPI = 151; Figure 2c) and up 260% from 2012 (MPI = 42). White oak MPI for 2013 was 20% above the long-term average of 126 for the group.

**Table 1. Rating system for classifying mast production.**

Rating	MPI range
Poor	0-75
Fair	76-150
Good	151-225
Excellent	226-300



**Figure 2. Statewide mean annual mast production indices for a) all oaks, b) red oak, and c) white oak from 1960-2013 with 53-year average for reference. Dotted lines are breaks between mast production ratings which are: E=excellent, G=good, F=fair, and P=poor.**

### Regional

Mast production of red and white oak groups varied by region with the highest production in the Lindley Breaks region and the lowest production in the Ozark West region (Table 2). The Union Breaks region, top producer of both red and white acorns in 2012, was the second most productive region in 2013. Red and white oak mast production was fair to good across all regions, which contrasts sharply with predominately poor production observed in 2012. Regional gains in mast production from 2012 ranged from 49-136% for red oaks and 112-360% for white oaks; meanwhile, increases in mast production relative to long-term averages were lower, ranging from 4-64% for white oak and 3-30% for red oak. For both oak species groups, the largest short-term gains (i.e., increase relative to 2012) in mast production occurred in the Ozark Border region, while the Lindley Breaks region registered the largest long-term gain (i.e., increase relative to 53-year average).

**Table 2. Regional indices by species group, 2009-2013.**

Year	Ozark Border		Ozark West		Ozark East		Union Breaks		Lindley Breaks	
	Red oak	White oak	Red oak	White oak	Red oak	White oak	Red oak	White oak	Red oak	White oak
2009	108	85	157	107	55	62	140	144	132	147
2010	117	54	160	102	169	92	173	57	187	97
2011	135	193	122	198	119	174	148	153	138	176
2012	65	31	77	37	64	38	114	77	85	45
2013	153	144	143	136	147	152	170	162	175	175
$\mu$	140	133	138	131	128	118	135	127	135	107

$\mu$  = Average for 1960-2013

## DISCUSSION & CONCLUSIONS

The results of the 2013 MDC mast survey indicated that acorn production was fair to marginally good for red, white, and all oaks both regionally and statewide. This year's total acorn production (i.e., all oaks combined) contrasts sharply with the estimate for 2012, which was the lowest recorded over the 53-year history of the mast survey. Total acorn production in 2013 was more than double the production observed in 2012. Low production in 2012 was likely due, in part, to the severe drought and record-setting high temperatures experienced during 2012. However, Missouri experienced a much milder growing season in 2013. Average monthly temperature and precipitation for the period of March to September were approximately 2°F below and nearly 1 inch above the long-term average (1895-2010), respectively. Since oak reproduction is affected by weather, milder conditions in 2013 could partially explain the large increases in acorn production seen at state and regional scales.

Differences in production from 2012 observed between species groups also suggest a weather effect. White oak acorn production was estimated to be about 100-400% greater at state and regional levels. Although not as dramatic, estimates of red oak production were approximately 50-150% above 2012 estimates. White oaks take just one growing season to produce acorns, while red oaks take two seasons. The shorter reproductive cycle of white oaks, confined to a single season, suggests that their acorn crop in any given year is more strongly tied to weather during the same growing season. For red oaks, the two-year reproductive cycle may respond with an acorn crop that reflects conditions in both the same and previous years' growing seasons.

Based on these findings, there could be above average oak mast available for Missouri's wildlife this fall and winter.

## ACKNOWLEDGEMENTS

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